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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/803,801
Filing Date: March 12, 2001
Appellant(s): HADDAD, KHALIL CAMILLE

Kevin M. Mason
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed August 3, 2007 appealing from the Office action mailed November 16, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The Examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is incorrect. The Applicant notes correctly that,

> "Claims 1, 2, 4-6, 10-12, 14-16, and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nedic et al (United States Patent Number 6,563,841; hereinafter "Nedic") in view of Haddad et al. ("Design of Digital Linear-Phase FIR Crossover Systems of Loudspeakers by the Method of Vector Space Projections," Haddad, Khalil C et al; hereinafter "Haddad"), claims 19, 20, 22-24, and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nedic in view of Haddad, and in further view of Gandhi et al (United States Patent Number 6,112,218; hereinafter "Gandhi"), and claims 3, 7, 8, 13, 21, 25, and 26 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nedic in view of Haddad, and in further in view of Khalil C ("Constrained FIR Filter Design by the Method of Vector Space Projections," Haddad, Khalil C et al; hereinafter "Khalil")." (pg. 2 of Applicant's Appeal Brief).

but incorrectly states that,

> "Claims 1, 2, 4-6, 10-12, 14-16, and 18 are also rejected under 35 U.S.C. §103(a) as being unpatentable over Haddad et al in view of Younce et al, (United States Patent Number 5,521,908), claims 19, 20, 22-24, and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over Haddad in view of Younce, and in further view of Gandhi et al and claims 3, 7, 8, 13, 21, 25, and 26 are rejected under 35 U.S.C. §103(a) as being unpatentable over Haddad in view of Younce, and further in view of Khalil." (pg. 2 of Applicant's Appeal Brief).

because the rejections under 35 U.S.C. § 103(a) including at least Haddad in view of Younce were withdrawn in the last non-final office action dated November 16, 2006. Therefore, only the rejections including at least Nedic in view of Haddad remain.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is incorrect. Again, no rejections based upon Haddad in view of Younce are set forth in the last non-final office action dated November 16, 2006

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Nedic et al (U.S. Pat. No. 6563841; "Nedic")

Haddad et al ("Design of Digital Linear-Phase FIR Crossover Systems of Loudspeakers by the Method of Vector Space Projections", Haddad, Khalil C. et al; "Haddad").

Gandhi et al (US 6112218; "Gandhi").

Haddad, Khalil C. ("Constrained FIR Filter Design by the Method of Vector Space Projections", Haddad, Khalil C. et al; "Khalil")

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 4-6, 10-12, 14-16, and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nedic et al (U.S. Pat. No. 6563841; hereafter "Nedic") in view of Haddad et al ("Design of Digital Linear-Phase FIR Crossover Systems of Loudspeakers by the Method of Vector Space Projections", Haddad, Khalil C. et al; hereafter "Haddad" – previously cited).

Regarding claim 1, Nedic discloses a time domain filter (fig. 1, ref. 32) which is comprised of a shortening finite impulse response filter (FIR) or "shortening impulse response filter" (SIRF) to compensate for the non-ideal response of a transmission channel. (col. 2, lines 51-65). Nedic discloses that the SIRF filter employs a finite number of coefficients to compensate for the transmission channel. Nedic does not explicitly disclose a method of determining the values of the coefficients via vector space projection methods (VSPM). However, Haddad teaches an exemplary method of designing a finite impulse response (FIR) filter (title; pg. 3058, col. 2, lines 15-16), said method comprising the steps of: establishing at least one set of defining constraints that said filter must satisfy in a time domain (pg. 3060, col. 2, line 9-15; equ. 11); establishing at least one set of defining constraints that said filter must satisfy in a frequency domain (pg. 3060, col. 1, line 26 – col. 2, line 9; equ. 8, 9, and 10); and determining an intersecting set of said at least one set of defining constraints that said

filter must satisfy in the time domain and said at least one set of defining constraints that said filter must satisfy in the frequency domain (pg. 3059, col. 2, lines 39-44; pg. 3060, fig. 2). Haddad teaches a method to solve a mathematical problem encompassing multiple constraints by vector space projection (page 3059, lines 10-16). Haddad further teaches that the desired result of using the vector space projection method (VSPM) is the "solution set" or the set that satisfies all the constraints (page 3059, lines 38-42; fig. 2) and that the VSPM method has significant flexibility in that any number of constraints may be incorporated (page 3063, lines 8-11). Because an SIRF filter is a particular type of FIR filter, one skilled in the art would be motivated to use Haddad's exemplary coefficient determining method for SIRF filters (such as that of Nedic) as well as FIR filters. Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to utilize the VSPM method of Haddad to determine the shortening impulse response SIRF filter of Nedic because designing an SIRF filter using VSPM methods would allow for flexible design using multiple constraints.

Regarding claim 2, Nedic in view of Haddad disclose the limitations of claim 1 as applied above. Further, Haddad discloses that said at least one set of defining constraints that said filter must satisfy in the time domain define a filter having a linear phase response (pg. 3060, eq. 11, col. 2, lines 26-28).

Regarding claim 4, Nedic in view of Haddad disclose the limitations of claim 1 as applied above. Further, Haddad discloses that the time domain constraints specify a length of the impulse response L (pg. 3060, eq. 11, col. 2, lines 26-28) and Nedic discloses that an SIRF filter shortens a channel impulse response. (col. 2, lines 51-65).

Therefore, in the method of Haddad in view of Nedic, VSPM would be utilized to shorten the impulse response of the SIRF filter via the time domain constraints.

Regarding claim 5, Nedic in view of Haddad disclose the limitations of claim 1 as applied above. Further, Haddad discloses that the frequency domain constraints include a frequency response for the SIRF filter that does not attenuate a received signal (fig. 3). Figure 3 of Haddad illustrates frequency domain attenuation regions for various filters which do not attenuate a received signal because they have a flat magnitude response.

Regarding claim 6, Nedic in view of Haddad disclose the limitations of claim 1 as applied above. Further, Haddad discloses that the frequency domain constraints include a pass-band for said SIRF filter (fig. 3.). Figure 3 of Haddad illustrates frequency domain attenuation regions for various filters which include pass-band regions because they have a flat magnitude response or pass-band over a range of frequencies.

Regarding claim 10, Nedic in view of Haddad disclose the limitations of claim 1 as applied above. Further, Haddad discloses that the VSPM method is iteratively applied between the time and frequency domain constraints until the sets converge (fig. 2).

Regarding claim 11, Nedic in view of Haddad disclose the limitations of the claim as applied to claim 1 above.

Regarding claim 12, Nedic in view of Haddad disclose the limitations of claim 11 as applied above. Further, Nedic in view of Haddad disclose the remaining limitations of the claim as applied to claim 2 above.

Regarding claim 14, Nedic in view of Haddad disclose the limitations of claim 11 as applied above. Further, Nedic in view of Haddad disclose the remaining limitations of the claim as applied to claim 4 above.

Regarding claim 15, Nedic in view of Haddad disclose the limitations of claim 11 as applied above. Further, Nedic in view of Haddad disclose the remaining limitations of the claim as applied to claim 5 above.

Regarding claim 16, Nedic in view of Haddad disclose the limitations of claim 11 as applied above. Further, Nedic in view of Haddad disclose the remaining limitations of the claim as applied to claim 6 above.

Regarding claim 18, Nedic in view of Haddad disclose the limitations of claim 11 as applied above. Further, Nedic in view of Haddad disclose the remaining limitations of the claim as applied to claim 10 above.

3. Claims 19, 20, 22-24, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nedic in view of Haddad, and in further view of Gandhi et al (US 6112218; hereafter "Ghandi" – previously cited).

Regarding claim 19, Nedic in view of Haddad disclose a method for determining coefficient values for a shortening impulse response filter (SIRF) as applied to claim 1 above. Although digital signal processors (DSP) executing instructions stored on memory communicatively coupled to them are notoriously known for implementing inventions which process digital information, Nedic in view of Haddad do not disclose the use of one. However, Ghandi does teach the use of a DSP and a memory for implementing a filter (abstract; col. 18, lines 28-35). Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to utilize a memory and a DSP as taught by Ghandi in the method of Nedic in view of Haddad because it provides an exceptionally flexible means to implement the filter.

Regarding claim 20, Nedic in view of Haddad, and in further view of Gandhi disclose the limitations of claim 19 as applied above. Further, Haddad discloses that

said at least one set of defining constraints that said filter must satisfy in the time domain define a filter having a linear phase response (pg. 3060, eq. 4, col. 2, lines 26-28).

Regarding claim 22, Nedic in view of Haddad, and in further view of Gandhi disclose the limitations of claim 19 as applied above. Further, Haddad discloses that the time domain constraints specify a length of the impulse response *L* (pg. 3060, eq. 11, col. 2, lines 26-28) and Nedic discloses that an SIRF filter shortens a channel impulse response. (col. 2, lines 51-65). Therefore, in the method of Haddad in view of Nedic, VSPM would be utilized to shorten the impulse response of the SIRF filter via the time domain constraints.

Regarding claim 23, Nedic in view of Haddad, and in further view of Gandhi disclose the limitations of claim 19 as applied above. Further, Haddad discloses that the frequency domain constraints include a frequency response for the SIRF filter that does not attenuate a received signal (fig. 3). Figure 3 of Haddad illustrates frequency domain attenuation regions for various filters which do not attenuate a received signal because they have a flat magnitude response.

Regarding claim 24, Nedic in view of Haddad, and in further view of Gandhi disclose the limitations of claim 19 as applied above. Further, Haddad discloses that the frequency domain constraints include a pass-band for said SIRF filter (fig. 3.). Figure 3 of Haddad illustrates frequency domain attenuation regions for various filters which include pass-band regions because they have a flat magnitude response or pass-band over a range of frequencies.

Regarding claim 28, Nedic in view of Haddad, and in further view of Gandhi disclose the limitations of claim 19 as applied above. Further, Haddad discloses that the

VSPM method is iteratively applied between the time and frequency domain constraints until the sets converge (fig. 2).

4. Claims 3, 7, 8, 13, 21, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nedic in view of Haddad, and in further view of Haddad, Khalil C. ("Constrained FIR Filter Design by the Method of Vector Space Projections", Haddad, Khalil C. et al; hereafter "Khalil" – previously cited).

Regarding claim 3, Nedic in view of Haddad disclose the limitations of claim 1 as applied above. Nedic in view of Haddad do not disclose that said at least one set of defining constraints that said filter must satisfy in the frequency domain define a filter having a non-linear phase response. However, Khalil teaches a VSPM method wherein a filter is designed having an arbitrary magnitude and phase response (page 719, col. 1, lines 20-40; col. 2). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to create a filter with an arbitrary magnitude and phase response as suggested by Khalil depending upon the desired filter response. Applicant has not disclosed that the particular set of constraints provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with several different types of magnitude and phase response because the VSPM method is very flexible. Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to design a filter having an arbitrary magnitude and phase response as suggested by Khalil in the method of Nedic in view of Haddad because it represents an arbitrary design which is flexible.

Regarding claim 7, Nedic in view of Haddad disclose the limitations of claim 2 as applied above. Nedic in view of Haddad do not disclose the particular set of defining

constraints as further limited in the claim. However, Khalil teaches a VSPM method wherein a filter is designed according to the set of constraints (page 716, col. 1, lines 20-40; col. 2). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to utilize the particular set of defining constraints as suggested by Khalil depending upon the desired filter response. Applicant has not disclosed that the particular set of constraints provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with several different types of constraint sets because the VSPM method is very flexible. Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to utilize the set of constraints as suggested by Khalil in the method of Nedic in view of Haddad because it represents an arbitrary design which is flexible.

Regarding claim 8, Nedic in view of Haddad disclose the limitations of claim 3 as applied above. Nedic in view of Haddad do not disclose the particular set of defining constraints as further limited in claim the claim. However, Khalil teaches a VSPM method wherein a filter is designed according to the set of constraints (page 716, col. 1, lines 20-40; col. 2). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to utilize the particular set of defining constraints as suggested by Khalil depending upon the desired filter response. Applicant has not disclosed that the particular set of constraints provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with several different types of constraint sets because the VSPM method is very flexible. Therefore, it would have been obvious to one having ordinary skill in the art at the time

which the invention was made to utilize the set of constraints as suggested by Khalil in the method of Nedic in view of Haddad because it represents an arbitrary design which is flexible.

Regarding claims 13 and 21, the respective limitations of claims 11 and 19 are disclosed by Nedic in view of Haddad as applied above. Further, the additional limitations of claims 13 and 21 are disclosed by Khalil as applied to claim 3 above.

Regarding claims 25 and 26, the respective limitations of claims 20 and 21 are disclosed by Nedic in view of Haddad as applied above. Further, the additional limitations of claims 25 and 26 are disclosed by Khalil as applied respectively to claims 7 and 8 above.

(11) Response to Argument

A1. Appellant's Argument with respect to each independent claim:

Because "Nedic does not disclose or suggest *determining an intersecting set of at least one set of defining constraints that a SIRF filter must satisfy in the time domain and at least one set of defining constraints that the SIRF filter must satisfy in the frequency domain by employing vector space projection methods*" (pg. 5), the prior art combination of Nedic in view of Haddad does not cover every claimed feature. Furthermore, there is no disclosure or suggestion in any of the cited references to combine Nedic with the method of Haddad. (pg. 6).

B1. Examiner's Response:

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Admittedly, Nedic does not disclose a method of defining constraints and determining coefficients using a vector space projection method. However, the deficiencies of Nedic are compensated by Haddad. The Applicant's argument is flawed in that it suggests that each reference of a combination must contain every limitation of the claims.

The differences between the prior art reference Haddad and independent claims 1 and 11 is only an amorphous label. That is, the method of defining constraints and determining coefficients of Haddad ***covers each and every limitation of claims 1 and 11 except*** that Haddad's article *is described as pertaining to Finite Impulse Response Filters (FIR) rather than Shortening Impulse Response Filters (SIRF)*. (The differences between FIR and SIRF filters is covered below.) It is noted by the Examiner that the Applicant does not argue that Haddad fails to disclose, in full, the claimed Vector Space Projection Methods (VSPM) for determining coefficients of a digital filter. The Examiner notes that the only named inventor, Khalil Haddad, is the author of both prior art references Haddad et al ("Design of Digital Linear-Phase FIR Crossover Systems of Loudspeakers by the Method of Vector Space Projections", Haddad, Khalil C. et al; "Haddad") and Haddad, Khalil C. ("Constrained FIR Filter Design by the Method of Vector Space Projections", Haddad, Khalil C. et al; "Khalil"). The prior art reference

Haddad, authored in part by the only named inventor, was published in 1999 and may, arguably, be considered a statutory bar against the instant application.

The difference between an FIR and SIRF filter is amorphous and, as notoriously understood in the art, is not due to any structure of the digital filter itself but rather can only be attributed to the selection of such filter's coefficients in as much as they alter the filter's response to an impulse input. An FIR filter, as understood by one having ordinary skill in the art, has a finite output response to an impulse input. That is, its output does not continue indefinitely in response to an impulse input in contrast to an Infinite Impulse Response Filter (IIR). An SIRF filter can be considered to be a subset of a broader category of FIR filters as understood by one having skill in the art. The fact that an SIRF filter can be composed of an FIR filter having a particular set of coefficients is notoriously understood in the art and is evidenced by the disclosure of Nedic which provides,

> "The time-domain equalizer 32 is a finite impulse response (FIR) filter designed to compensate for the non-ideal impulse response h(n) of the transmission channel 20. In particular, the time-domain equalizer 32 employs a finite number of coefficients which are calculated to compensate for the non-ideal impulse response of the transmission channel 20. The time domain equalizer 32 operates on the impulse response h(n) of the channel 20 such that the combined impulse response h_{eff} (n) of the channel 20 and the time domain equalizer 32 has a maximum of energy within a limited band (or set) of consecutive samples. This may be thought of as "shortening" the effective impulse response of the channel 20." (col. 2, lines 55-68; emphasis added).

Nedic's definition of a "shortening" FIR filter surely covers the claimed SIRF filter. In effect, Nedic's disclosure evidences the fact that Haddad's own "FIR" filter could, in reality, be an SIRF filter depending upon the constraints it must satisfy.

Although no specific motivation is provided in either the disclosures of Nedic or Haddad to utilize Haddad's VSPM method to choose Nedic's FIR filter's coefficients to have properties which categorize it as a SIRF filter, given the nature of the combination and the differences between the prior art references and the claimed invention, the Examiner maintains that no motivation is required. In fact, the use of the both references Nedic and Haddad was not particularly provided to modify either reference but rather to spotlight the lack of patentable difference between the prior art reference Haddad and that of the claims of the instant application. Nonetheless, the Examiner further affirms that Haddad's VSPM methods as disclosed in the prior art reference Haddad should be considered as an exemplary method for determining filter coefficients which would motivate one skilled in the art to utilize them for the design of any (i.e. Nedic's) digital filter. Otherwise, it would have been obvious for one skilled in the art to try to apply Haddad's VSPM method in the design of any digital filter (i.e. Nedic's) because Haddad's VSPM method of filter design is known and accepted in the art.

Finally, Applicant has provided no secondary indications of non-obviousness such as (1) the invention's commercial success, (2) long felt but unresolved needs, (3) the failure of others, (4) skepticism by experts, (5) praise by others, (6) teaching away by others, (7) recognition of a problem, or (8) copying of the invention by competitors. Particularly, the Examiner's attention has not been directed to the fact that the VSPM methods of the instant application as applied to the design of SIRF filters as opposed to FIR filters (which was provided, in print, to the public by the inventor in 1999) provides any particular advantage. Rather, as argued above, the difference between them is only in the filter's label which is an amorphous and, perhaps, nonsensical distinction not subject to protection under United States Patent Laws.

A2. Appellant's Argument with respect to rejections including Khalil:

Khalil does not constitute prior art under 35 U.S.C. 103(a) since it was published in August 2000, since the instant application has a filing date of March 12, 2001 and the prior art reference was incorporated into the instant application by reference.

B2. Examiner's Resonse:

With respect to the Applicant's statement that Khalil C. ("Constrained FIR Filter Design by the Method of Vector Space Projections", Haddad, Khalil C. et al; "Khalil") does not constitute prior art under 35 U.S.C. § 103(a) because, supposedly, it does not apply as prior art under 35 U.S.C. § 102(a), the argument is not persuasive. The incorporation by reference of Khalil into the instant application does not restrict it's use as a reference under 35 U.S.C. § 102(a). Furthermore, Khalil constitutes prior art under 35 U.S.C. § 102(a) because it is "known by others". That is, the inventors of the instant application are not the same as writers of the prior art reference Khalil.

(12) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,
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Art Unit 2611
September 13, 2007

jmp

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